

PROCEEDINGS OF LEARNED SOCIETIES.

ROYAL SOCIETY.

March 11, 1858.—Dr. Hooker, Vice-President, in the Chair.

“Description of the Skull and Teeth of the *Placodus laticeps*, Ow., with indications of other new species of *Placodus*, and evidence of the Saurian nature of that extinct genus.” By Prof. Richard Owen, F.R.S. &c.

The author premises a brief sketch of the history of the discovery of the fossils referred by Count Münster, and Professors Agassiz, Bronn, and Meyer to the Pycnodont family of Ganoid Fishes, under the generic name of *Placodus*; and then enters upon the anatomical grounds on which he concludes that the *Placodus* is a Saurian reptile. These are stated to be, principally,—1, distinct external bony nostrils, divided by an ascending process of the premaxillary, and bounded by that bone, the maxillaries and nasals; 2, orbits circumscribed below by the superior maxillary and malar bones; 3, temporal fossæ of great size and width, bounded externally by two zygomatic arches, the upper formed by the postfrontal and mastoid, the lower formed by the malar and squamosal; 4, the tympanic bone formed by one bony piece, with a trochlear lower articular surface; the limitation of the teeth to the premaxillary, maxillary, palatine, and pterygoid bones, in the upper jaw, with a demonstrated absence of a median vomerine series, such as exists in the true Pycnodonts. With these proofs of the reptilian nature of the *Placodus*, Prof. Owen combines others exemplifying its affinities to the Lacertian order, and more especially with that modification of *Lacertia* exemplified by the extinct genus *Simosaurus*, from the Muschelkalk.

The author then describes the dentition of the upper jaw of the specimen of *Placodus*, demonstrating the foregoing characters. It includes two premaxillary and three maxillary teeth, forming an outer or marginal series, and two teeth of larger size, forming an inner or palatal series, the last of which is described as the largest grinding tooth in proportion to the size of the head, hitherto known in the animal kingdom.

From the cranial and dental characters the author deduces the specific distinction of his specimen from previously described *Placodi*, and proposes for it the name of *Placodus laticeps*, in reference to the great breadth of the skull, which equals the entire length, each measuring about 8 inches. All the teeth are implanted in distinct sockets, according to the thecodont type of the Lacertian order. The relation of the large temporal fossæ and of the wide span of the zygomatic arches, to the enormous muscular force required to work the crushing machinery of the jaws, is pointed out.

The structure of the bony nostrils, the orbits, the palate, with other particulars of the cranial anatomy of the *Placodus*, is next described in detail, and compared with the same characters in *Nothosaurus*, *Simosaurus*, *Pistosaurus*, and other Muschelkalk reptiles. The dentition of these Saurians, although, like *Placodus*, thecodont in

respect of implantation, is of the ordinary crocodilian type in respect of form, adapted to the prehension of fishes; and there are no palatal teeth. But the author remarks that such teeth exist in the triassic Labyrinthodonts, with a disproportionate magnitude of certain teeth which offers a certain analogy with the dentition of *Placodus*. An account of the microscopic structure of the dentine, enamel, and osseous tissue of the *Placodus* is then given.

The extreme and peculiar modification of the teeth, in respect to form and size, adapting them to the crushing and pounding of hard substances, and the association of the *Placodus* with conchiferous mollusks in such abundance as to have suggested the terms 'Muschelkalk,' 'Terebratuliten-kalk,' and the like, for the strata containing them, concur in evincing the class whence the *Placodi* derived their chief subsistence; and the author points out the relation of a constant disposition of the teeth, in all the known species, to the readier cracking of shelly substance. A single row of teeth in the lower jaw is always opposed to a double row in the upper one, playing, with its strongest line of force, upon their interspace. Thus the crushing force below presses upon a part between the two points of resistance above, on the same principle on which a stick is broken across the knee; only here the fulcrum is at the intermediate point, the moving powers at the two parts grasped by the hands. It is obvious that a shell pressed between two opposite flat surfaces might resist the strongest bite; but, subjected to alternate points of pressure, its fracture is facilitated.

Certain Australian lizards present teeth with large rounded obtuse crowns, like those of certain *Placodi*, and have on that account received the name of *Cyclodus*, for their genus.

The author next proceeds to describe certain specimens of the mandible or under jaw of the genus *Placodus*. The first of these he refers to a species for which he proposes the name of *Placodus pachygnathus*. The second may probably be the lower jaw of the *Placodus Andriani*, Ag.; but should it prove to belong to a different species, the term *bombidens* would best express the specific peculiarity in the shape of the grinding surface of the teeth. A third species is named *Placodus bathygnathus*, in reference to the great vertical extent of the mandibular ramus.

All the above-described fossils are from the Muschelkalk member of the triassic series, near Bayreuth, Germany, and have been recently acquired for the Palæontological Series in the British Museum.

June 17, 1858.—The Lord Wrottesley, President, in the Chair.

“Description of some Remains of a Gigantic Land-Lizard (*Megalanian prisca*, Ow.) from Australia.” By Prof. Richard Owen, F.R.S.

The subject of this communication forms part of a collection of fossil remains from Australia, recently acquired by the British Mu-

seum, and demonstrates the former existence in that continent of a land-lizard considerably surpassing in bulk the largest species now known. The characters are chiefly derived from vertebræ, partially fossilized, equalling in size those of the largest existing Crocodiles; they are of the 'procelian' type, but present lacertian modifications, and closely agree with those in the great existing 'Lace-lizard' of Australia (*Hydrosaurus giganteus*, Gray), of which individuals upwards of six feet long have been taken. A generic or sub-generic distinction is indicated by the comparatively contracted area of the neural canal, and by the inferior development of the neural spine, of the fossil vertebræ, which have belonged to an individual not less than twenty feet in length, calculated from the vertebræ and proportions of the body of the existing *Hydrosauri*. For this, probably extinct lizard, the name of *Megalania prisca* is proposed.

The results of an extended series of comparisons of its vertebræ with those of recent and extinct Sauria are also given.

"Researches on the Foraminifera. — Part III. On the Genera *Peneroplis*, *Operculina*, and *Amphistegina*." By W. B. Carpenter, M.D., F.R.S. &c.

In his preceding memoirs, the author has shown that two very dissimilar types of structure present themselves among Foraminifera, one characterized by its simplicity, the other by its complexity. In the former, of which *Orbitolites*, *Orbiculina*, and *Alveolina* are typical examples, the calcareous skeleton does not present any definite indications of organization, but seems to have been formed by the simple calcification of a portion of the homogeneous sarcode-body of the animal; that sarcode-body is but very imperfectly divided into segments, the communications between the cavities occupied by these segments being very free and irregular; the form of the segments themselves, and the mode of their connexion, are alike inconstant; and even the plan of growth, on which the character of the organism as a whole depends, though preserving a general uniformity, is by no means invariably maintained. In the latter, to which *Cycloclypeus* and *Heterostegina* belong, the calcareous skeleton is found to present a very definite and elaborate organization. The several segments of the body are so completely separated from each other, that they remain connected only by delicate threads of sarcode. Each segment thus isolated has its own proper calcareous envelope, which seems to be moulded (as it were) upon it; and this envelope or shell is perforated with minute parallel tubuli closely resembling those of dentine, except in the absence of bifurcation; the partition-walls between adjacent segments are consequently double, and are strengthened by an intermediate calcareous deposit, which is traversed by a system of inosculating passages that seems properly to belong to it. The form of the segments, their mode of communication, and consequently the general plan of growth, have a very considerable degree of constancy; and altogether the tendency is strongly manifested in this type to the greater individuali-

zation of the parts of the composite body, which in the preceding must be looked upon rather as constituting one aggregate whole.

In the present memoir this contrast is fully carried out by a detailed comparison of two characteristic examples from these types respectively, each of them having its own features of peculiar interest.

In *Peneroplis* we find, both as to the simplicity of the structure of the shell, and the general disposition of the segments of the animal, a close resemblance to the spiral forms of *Orbiculina*; the only difference being the absence of the transverse or secondary divisions of the chambers. In what is considered its typical form, the shell is a flattened spire, opening out widely in its last whorl; and the chambers communicate with each other (as does the last chamber with the exterior) by single rows of isolated pores disposed at regular intervals along the septa. But the spire is occasionally found to be more turgid, and the rows of apertures to become doubled; and instead of opening out in the last whorl, it is frequently prolonged in a rectilineal direction. In tropical seas there are found minute shells resembling those of *Peneroplis* in their very characteristic external markings, but having a very turgid spire, and having the row of pores in each septum replaced by a single large orifice with irregularly radiating prolongations. This type of structure has been characterized by M. d'Orbigny as a separate genus, under the name of *Dendritina*; and when its spire, as in many forms of *Peneroplis*, is continued rectilineally, it has been distinguished as a third genus under the name of *Spirolina*. The author shows, by an extensive comparison of individuals, that the single dendritic orifice is to be regarded as formed by the coalescence of separate pores; and that the extension of these into a single line, or their aggregation into a cluster, is related to the form of the septal plane, as determined by the degree of flattening or of turgescence of the spire. Consequently in his view *Dendritina* and *Spirolina* are but varieties of *Peneroplis*; the former, which are by far the largest and the most highly developed, being of tropical growth, whilst the most flattened forms of the latter are the comparatively stunted inhabitants of the Mediterranean and other seas of less elevated temperature.

In *Operculina*, on the other hand, we find the shell presenting the minutely tubular structure which was first shown by the author to exist in *Nummulites*; to which genus *Operculina* is so closely allied in structure, that the only positive difference between them seems to lie in the tendency of *Operculina* to open out widely in the last whorl, whilst *Nummulites* (according to MM. d'Archiac and Haime) tends to close in. The author minutely describes the structure of *Operculina*, which presents a very remarkable development of the canaliferous system; he also enters into a detailed inquiry into the relation of the numerous strongly-marked varieties of form which it presents,—a question of much importance in regard to the value of the characters of the reputed species among *Nummulites*; and shows that the range of individual variation in form and surface-

markings is so wide (as is proved by the gradational transitions which present themselves between what at first sight appear to be widely-separated types), that only where some very decided and constant difference of internal conformation presents itself, will it be safe to assume a specific diversity. In one case, in which he had thought that a certain series of specimens was sufficiently distinguished by its peculiar physiognomy from the rest, residual forms presented themselves which could not be with certainty assigned to either type, so completely do they link together the two by the softening down of the peculiarities of each. And a yet more remarkable link of connexion is established by examples collected on the coast of Japan by the American expedition to that country, in which the most distinctive characters of each type are curiously combined.

Closely related to *Operculina* is another genus, *Amphistegina*, which bears an equally near resemblance to *Nummulites*, though it has been completely separated from both in the classification of M. d'Orbigny, who has placed it in a distinct order, *Entomostegues*, on account of the unsymmetrical form of its shell and the alternating disposition of its chambers. But the author has found, from an extensive comparison of individuals, that this want of symmetry is so little constant, as to be altogether valueless in a systematic point of view, many specimens being perfectly symmetrical, whilst others are very far from being so, and every gradation presenting itself between these two extremes. The most common among existing species is the *Amphistegina gibbosa*, which is very extensively diffused through the tropical ocean, and which, though generally of small size, acquires in the Philippine region dimensions nearly equal to those of the fossil *Amphistegina* of the Vienna and other tertiary deposits. But Mr. Cuming's Philippine collection contains another and far larger species, which is distinguished by the extraordinary thinning-out of the last whorl; and it is remarkable that in this species the canal-system is highly developed, although completely absent in *A. gibbosa*,—a difference of structure, which, being associated with a very close resemblance in external aspect and general conformation, seems only to be accounted for on the supposition that the difference in size requires a difference in the arrangement of the nutrient apparatus.

ZOOLOGICAL SOCIETY.

March 9, 1858.—Dr. Gray, F.R.S., V.P., in the Chair.

PROPOSAL TO SEPARATE THE FAMILY OF SALAMANDRIDÆ, GRAY, INTO THREE FAMILIES, ACCORDING TO THE FORM OF THE SKULL. BY DR. J. E. GRAY, F.R.S., V.P.Z.S., PRES. ENT. SOC., ETC.

In the Catalogue of Amphibia in the British Museum I placed all the Salamanders which have teeth on the inner side of the hinder edge of the palatal bone together in a single family, under the name of *Salamandridæ*.